Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Period: \_\_\_\_\_\_

**Finch Beak Evolution Graphing and Statistics Activity – Part 1**

AP Biology, Ms. OK, 2014-2015

***Directions:*** *Please answer each question thoroughly and accurately in complete sentences.*

**Part B – Analyzing Graphical Data**

1. What observations can you make about the overall shape of both graphs? (Imagine that you are drawing a line that connects the tops of the horizontal bars.)

2. Compare the distribution of beak depth measurements between the two groups of finches. You may wish to discuss the range of measurements or most common measurements for each group.

3. Based on what you saw in the film, think about how changes in the environment may have affected which birds survived the drought. Propose an explanation for the differences in the distribution of beak depths between survivors and nonsurvivors.

4. Let’s look in more detail at the mean beak depths in the two groups of birds to understand the meaning of standard deviation.

a. How do the mean beak depths and standard deviations of the mean beak depths compare?

b. If the standard deviation of the two samples were to be vastly different, what would you conclude about the two groups?

**Part C – Examining the Importance of Sample Size**

5. For each sample, calculate the mean beak depth and standard deviation (s) for those samples and add those numbers to the table given below. Note: the standard deviation for each 15 bird sample is given below because it takes too long to calculate by hand!

Please also add in the mean and standard deviation for the 50 bird samples shown in the graphs in Part B.

To calculate standard deviation, use the following formula and steps:



• Calculate the mean (𝑥) of the data set.

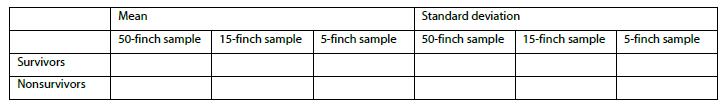
• For each measurement (𝑥i) in the set of data, determine the difference between that measurement and the mean (𝑥) of the entire set. (𝑥i − 𝑥).

• Square each result (𝑥i − 𝑥)2.

• Add up (sum, Σ) all of the squared differences. Σ(𝑥i − 𝑥)2.

• Divide by sample size minus 1 (*n* – 1)

• Take the square root and round your answer to the second decimal place.



**0.90**

**0.98**

6. Compare the means and standard deviations for each sample size (5 birds, 15 birds, and 50 birds) within each group of survivors and nonsurvivors.

a. Are the means in smaller samples different from the means in larger samples? Explain why you think that is.

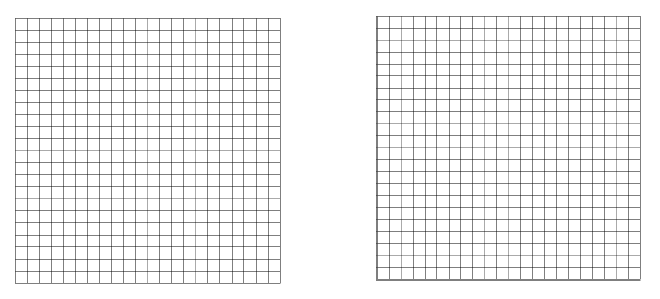
b. Are the standard deviations in smaller samples different from standard deviations in larger samples? Explain why you think that is.

7. Which results (i.e., from 5, 15, or 50 birds) do you think are closer to the means and standard deviations of the entire population of medium ground finches on the whole island? Explain your answer.

8. What is one advantage and one disadvantage of calculating the mean from a sample of a population rather than the entire population?

**Part D – Adaptive Traits and Constructing Graphs**

9. To compare a single value for two different populations, a bar graph is often a good choice. In the space below, construct two bar graphs showing the mean values for wing length for the two groups of birds on one graph and mean values for body mass for the two groups of birds on the other. Title your two graphs and label your axes. Make sure to include units on your axis labels and appropriate scales.



10. Based on the graphs you have drawn how does wing length compare between survivors and nonsurvivors? What about body mass?

11. Based on the graphs you have drawn how does wing length compare between survivors and nonsurvivors? What about body mass?

12. Explain why the Grants concluded that beak depth may have played a more important role in survival during the drought than wing length or body mass. Correctly use the terms natural selection, adaptation, and fitness in your answer.

13. Explain the importance of having variation in essential traits (like beak depth) in a population for the survival of a species.